Science as the Enlightened Route to Paradise?

Adelaide Meira Serras
Faculdade de Letras da Universidade de Lisboa
CEAUL

"Man has existed for about a million years. He has possessed writing for about 6,000 years, agriculture somewhat longer. Science as a dominant factor in determining the beliefs of educated men, has existed for about 300 years; as an economic technique, for about 150 years. In this brief period it has proved itself an incredibly powerful revolutionary force." (Russell 11)

Those were Bertrand Russell's opening words in his celebrated essay entitled *The Impact of Science on Society* published in the mid-twentieth century, when concerns about the ethical consequences of scientific and technological advances were strongly inflamed owing to the devastating effects of the nuclear bomb in Hiroshima and Nagasaki. Russell's emphasis on the recent and almost sudden role played by science in men's lives and states, besides highlighting his undefeatable optimism, makes us wonder about our enlightened forefathers' goals and certainties.

Starting with rather timid steps, while competing with other approaches to knowledge, such as divinely revealed truth, or the use of magic, not to mention the previous scholastic legacy, transmitted from generation to generation with the *magister*'s stamp of authority, science has had to prove itself to ensure a better understanding of the world and, in consequence, a better relationship between men and Nature.

In fact, the words "science" and "scientist" were not widely used until the nineteenth century. Previously, science meant, in a comprehensive way, well-defined fields of knowledge, such as physics, and other not so autonomous facets of

the natural world – for instance, botany, zoology, and geology – thus constituting so-called "natural philosophy". Science, however, also contemplated the philosophic debate concerning human ability and methods to attain true knowledge. Nevertheless, experiments and investigation about natural phenomena were enthusiastically underway since the seventeenth century.

According to Voltaire, in "Letter IV" of his *Letters Concerning the English Nation* (1733), Bacon, Locke and Newton were the unquestionable founders of the new approach to knowledge. He further distinguishes Bacon's important role in the increasing widespread interest in this "New Learning":

> In a Word, no one, before the Lord Bacon, was acquainted with experimental Philosophy, nor with the several physical Experiments which have been made since his Time. Scarce one of them but is hinted at in his Work, and he himself had made several. He made a kind of pneumatic Engine, by which he guess'd the elasticity of the Air. He approach'd, on all Sides as it were, to the Discovery of its Weight, and had very near attain'd it, but some Time after Torricelli seiz'd upon this Truth. In a little Time experimental Philosophy began to be cultivated on a sudden in most parts of Europe. 'Twas a hidden Treasure which the Lord Bacon had some Notion of, and which all the Philosophers, encourag'd by his Promises, endeavour'd to dig up. (Voltaire 52)

The wide popularization of the new science in coffee and chocolate houses, as well as in scientific associations such as the Royal Society of London (founded in 1660), promoted both by Bacon, Newton, Boyle and other scientists, *philosophes* and dilettanti alike, obviously contributed to its consolidation as a major cultural factor. However, the concrete advances, for instance, in medicine, and the new technologies (either real, or just imagined) in prolonging life while making it more comfortable and interesting, paved the way for the enthusiastic reception of Science as the modern key to happiness, in an earthly, humanly remodeled paradise.

Francis Bacon's essays *Novum Organum* and *The Advancement of Learning*, published in the first decades of the seventeenth century, aimed at introducing a new syllabus focused on several branches of experimental knowledge, thus replacing the Aristotelian method still applied at most universities. In the introductory words to *Novum Organum*, he urges the reader "to compel himself to sweep away all theories and common notions, and to apply the understanding, thus

made fair and even, to a fresh examination of particulars" (93). The defense of all knowledge based on observation and experimentation, together with the rejection of a pre-established system and a narrow specialization, would lead to the discovery of the fundamental laws of the universe, and so empower humankind in relation to the natural phenomena. He further appeases his readers' fear of this new epistemology, highlighting that knowledge – the correct understanding of the natural world – is rather a recovery than a discovery, since it was always there for men to study. In so doing, Christians are worshipping God through His divine creation. In his utopia, *New Atlantis*, written in the first decade of the seventeenth century, although only posthumously published by his chaplain, W. Rawley, Salomon's House, or the College of the Six Days' Work, the research and educational institution of the commonwealth, holds this very same idea: "The End of our Foundation is the knowledge of Causes, and secret motions of things; and the enlarging of the bounds of Human Empire, to the effecting of all things possible" (239).

Composed by a kind of brotherhood, and ruled by a holy figure called "the Father", whose appearance and gestures emulate those of a bishop, or even the Pope – for instance, he blesses the travelers, and they bent and kissed the hem of his garment (238-239) –, this foundation represents the college and research society Bacon hoped to see established in England. In order to soothe both king James, whom he dedicates his work to, and all his contemporaneous readers, he presents his imaginary commonwealth as a very orderly society, highly respectful of its political leaders, observant of their religious principles and creed, albeit tolerant to other faiths, honouring family values, chastity and incorruptibility. Science is thus presented as innocent, in spite of its power to improve man's lot.

Also worth noting are the current restrictions on publications concerning the discoveries and inventions performed by Salomon's House and, furthermore, the oath of secrecy that bounds its members, contradicting the Enlightenment's cherished purpose to diffuse knowledge. In the Atlantis commonwealth stability and safety suffice to justify the option for an oligarchy of enlightened despots, notwithstanding their paternalistic attitude of "bienfaisance" towards the people.

Peter Gay, when discussing the Enlightenment's politics of education, reveals the dilemma of the intelligentsia of the times:

> Education formed an indispensable part of [eighteenth-century rulers'] reform schemes: peasants needed to be instructed in the use of new implements, merchants and manufacturers to be acquainted with new techniques or products, public servants to be trained to new tasks. But civic education was something else again. After all, like all good education, good civic education aimed at making the educator unnecessary, and this required a degree of self-abnegation that the princes – all but one [the Archduke Leopold of Tuscany] – could not muster. (Gay 499)

The quiet, civically noncommittal scientific revolution Bacon envisaged, disappeared from the limelight due to the political turmoil which took place both in England with the seventeenth-century civil war – which led the country to an interregnum in the monarchical system – and later, in a transatlantic context, in the following century with the American Revolution, and a few years later with the French Revolution, the political epitaph of a despotically authoritarian European regime.

Distancing himself from the religious bias of Francis Bacon's apology of a society where science is paramount, d'Alembert, one of the main authors and editors of the *Encyclopédie* (1765) and a laic prophet of change, in the entry "Invention" also believes in the importance of the enlargement of scientific knowledge and technology as a means to progress:

> [...] all those who, thanks to their astuteness, their labours, their talents, and their diligence, will be able to combine research and observation, profound theory and experimentation, will continually enrich existing inventions and discoveries and will have the glory of paving the way for new ones. (Hyland 137)

Such was the case of Sir Isaac Newton, the first scion to be knighted on account of his outstanding contribution to further science, and president of the Royal Society of London for more than twenty years. In his remarkable work on physics and optics – also highlighted by Voltaire – he put into practice much of Bacon's theorizing, combining experience with mathematical calculus. The endorsement of mathematics as the most rigorous way of understanding, describing, and eventually predicting natural phenomena, became known in 1687

with his masterpiece *Philosophiae Naturalis Principia Mathematica*. There he explained that every particle of matter in the universe is attracted to every other with a force varying directly as the product of their masses and inversely as the square of their distance, that is, the notion of universal gravitation (Porter 133). In so doing, he not only advanced a comprehensive and coherent view of the solar system, but he also started a new perspective on dynamics, a mechanical theory associating Kepler's laws of the planets' orbits to Galileo's kinematics applied to terrestrial motion. Later, he would apply the same notion to microscopic intercorpuscular interactions, thus making possible important advances in chemistry, for instance. Of course his mechanical theory contradicted Gassendi's and Descartes' rationalistic notion of a passive mechanicism which considered the universe devoid of motion, unless by contact. Although based on the same view of a clock-work ruled universe – also embraced and developed by Spinoza, Leibniz and Hobbes – and the application of mathematical techniques to the measurable properties of matter as the sole method of discovery and exposition of Nature's laws, Newton's empiricist approach showed a clear divide between British and continental theories of knowledge. Instead of the almost arrogant certainty depicted in Descartes' *Discourse on the Method of Rightly Conducting One's Reason and of Seeking Truth in the Sciences* (*Discours de la Méthode pour bien Conduire sa Raison, et Chercher la Vérité dans les Sciences,* 1637), Newton's other masterpiece, *Opticks*, published in 1704, also opened new fields of research about light, heat, electricity, using a list of "queries" which would help to establish an experimental scientific methodology. Even his apparently contradictory interest in alchemy and theology testified to his devotion to study, his humble and pious attitude trying to understand and pass to his fellowmen God's grand design with a degree of precision and simplicity undreamt of before, as Berlin (15) pointed out while evoking Pope's famous lines:

> Nature and Nature's Laws lay hid in Night.
> GOD said, *Let Newton be!* and all was Light!
>
> (Davies 651)

John Locke – the most judicious and methodical Genius, or the most acute Logician, in Voltaire's opinion (cf. Voltaire 54) – in his work *Essay Concerning Human Understanding* (1690) would shed some doubt on this enthusiastic view of science as the path to true knowledge. Notwithstanding his indebtedness to Cartesian rationalism, he considered that the act of knowing began with the sensorial apprehension of the object by the subject; only afterwards would this subject's reason and understanding perceive the connection, or the lack of it, between two or more ideas, that is, representations of the world. These ideas, besides resulting from the outcome of one's sensitive awareness of the world, could be formed in an immediate manner, by intuition, or could require demonstration, but in every case one only got an understanding of the properties of the things that exist, never quite acquiring true knowledge. The shift to the empirical level of connection and to a second-hand appropriation of the external world would also lead Berkeley and David Hume to question the universal character of empiricism, thus abating the optimism of the first experimentalists. Moreover, Locke's denial of the existence of innate ideas and the assertion that every man was born in intellectual blankness – *tabula rasa* –, that only experience and learning would fulfil and enrich, paved the way to a scientific analysis of society, justifying the democratization of the regimes: given the same opportunities, everyone could be a well-informed citizen, able to forward his own decisions on any matter.

When Immanuel Kant, at the dawn of the century, summarizes his views on the Enlightenment in his celebrated essay entitled "Was ist Aufklärung?" (1784) he stresses precisely the autonomy of the citizen so that he can fully participate in the public sphere without becoming a puppet of some ruler's whims:

> Enlightenment is man's emergence from his self-imposed immaturity. Immaturity is the inability to use one's understanding without guidance from another. This immaturity is self-imposed when its cause lies not in lack of understanding, but in lack of resolve and courage to use it without guidance from another. *Sapere Aude*! [Dare to know] "Have courage to use your own understanding!" – that is the motto of enlightenment. (Gregor 13)

So the entanglement between science and the Enlightenment occurs at distinct levels: the reliability of science itself as true knowledge; the doubts

concerning human ability to gain knowledge and the best method, or methods, to do it; and the attempts to push the scientific approach to matters of social and political philosophy, as well as to the realm of aesthetics. The consequences thereof go far beyond the scope of this reflection, but they surely gave birth to waves of criticism, ranging from the denunciation of foul play by pseudo-scientists to the manifestation of skepticism about the scientific paradigm and its limits and actual viability to promise paradise on earth.

As far as the reliability of scientific knowledge and research is concerned, it is worth remembering two distinct critical voices: Margaret Cavendish and Jonathan Swift. Both writers were well-known for their inquisitive minds, their wit and political conservativeness, but were otherwise considered disparaging figures on socially dominant manners and behaviour. The former, an educated aristocratic lady, witnessed the regicide of Charles I and Charles's II restoration, having gone into exile in France during Cromwell's rule, historical events that definitely scarred, or molded her mind and character. The latter, a man of Anglo-Irish origin who spent most of his life in Ireland, with some spells in London in the service of Sir William Temple, and later of Lord Berkeley. In his maturity he abandoned his clerical work and embraced an ecclesiastical career in the Established Church of Ireland, becoming in due time the Dean of S. Patrick's cathedral. A poet, an essayist and a writer of fiction, he dedicated a good part of his work to denouncing what he considered ill-conduct, both of individuals and governments. It is no wonder that the scientific vogue among polite people and the way the members of the Royal Society seemed to delve in natural and social sciences stirred his interest and fed his satirist's vein.

In his utopian work *Travels into Several Remote Nations of the World, in four parts. By Lemuel Gulliver* (1726), especially in the third voyage to Laputa, Balnibarbi, Luggnagg, Glubbdubdrib, and Japan, he is adamant in his criticism of the illuminati who float on their flying saucer above the crude realities of the earthly world. Although they depend on the magnetic relation between the earth and their "flying island", and enjoy all the available comforts and luxury the inhabitants sent them from below, they consider themselves burdened with the responsibility of finding

new solutions for improving their people's lives. However, because of their unawareness of the material world and their constant abstract thinking, their experiments and inventions are rather ineffectual, though nobody dares say as much. Besides the obvious satire of rationalism with the depiction of the disastrous consequences of the intelligentsia's divorce from reality, the excess of ill-guided experimentalism may produce the same negative result. So an excess of abstract thinking or a pseudo-scientific approach may destroy the earthly paradise Bacon had promised, even if those with the power conferred by knowledge possess the best possible intentions to help their fellowmen. Only in the fourth and last voyage did the hero find an Edenic society, the country of the Houyhnhnms, where a very simple way of living has been adopted, devoid of sophisticated technology, but where ethical values are observed and respected by everyone.

Margaret Cavendish could be considered as an example of the wide popularization of works such as encyclopaedias or simplified versions of dense scientific treatises meant for children or women, like Francesco Algarotti's *Newtonianismo per le Dame* (1637), translated into English two years later with the title *Sir Isaac Newton's Philosophy Explain'd for the Use of the Ladies.* Notwithstanding the disseminating effect of such text books and pamphlets, Margaret Cavendish, Duchess of Newcastle, profited mainly from the informal debates about natural philosophy with Hobbes, Gassendi, Descartes held in her salon during the years of exile in France, the so-called "Newcastle circle". She continued to demonstrate her keen interest in science and research after her return to England with the Restoration, as is illustrated by her visit to the Royal Society of London, a major event at the time. She was the first woman to be admitted in that temple of science and there she had the opportunity to observe Boyle and Hooke going through several experiments, and to enquire about their methods and goals, but membership remained impossible for women.

However, Margaret Cavendish's utopia, *The Description of a New World, Called the Blazing World* (1666), deals with the theme of the pursuit of a paradisiacal region from a different perspective, in what both politics and knowledge are concerned. The work closes with a feeling – akin to Swift's criticism

and mistrust regarding the scientific and technological "progress" – of disappointment with the enlightened discoveries and decisions of the illuminati. The narrator, a very beautiful young lady – and Margaret's *persona* – due to a series of unfortunate accidents, enters a parallel world where everything is perfect: the land is beautiful and fertile, the natural resources are abundant, and the inhabitants live peacefully in a multiracial society ruled by the absolute power of their emperor. Things begin to deteriorate as a result of the changes ordered by the young lady after she marries the emperor and becomes the new empress, with all the power vested in her. Her idea of erecting schools and founding scientific societies for the improvement of knowledge leads but to dissention among the various groups and a profusion of opinions from the "vertuosos" and no certainties whatsoever. This ironic depiction of the Royal Society meetings and debates, together with her mistrust of instruments such as the microscope, much in fashion at the time, show us the fragile structure of the new science:

> Truly, said the Empress, I do believe that it is with natural philosophy, as it is with all other effects of nature; for no particular knowledge can be perfect, by reason knowledge is dividable, as well as composable; nay, to speak properly, nature herself cannot boast of any perfection, but God himself[.] (Cavendish 162)

The solution for these problems lies in the closure of such societies or in the confinement of their disputations and opinions to their own circles without disturbing the commonwealth, thus avoiding "an utter ruin and destruction both upon church and state" (162). The empress recovers, indeed, the Atlantis policy of concealment and filtering of information in order to secure a peaceful way of living, abjuring the Enlightenment motto enunciated by Kant, "dare to know".

In Margaret Cavendish's brilliant world, happiness and well-being are easily recovered once the empress recognizes her misjudgment and annuls all the changes she introduced in scientific societies and educational institutes, as well as in the religious and political domains. Paradise is in this case regained by virtue of the authoress's will and imagination, but in reality change does not come so easily and the idea of a perfect commonwealth lingers in men's minds up to the present.

To pass on information from generation to generation and among every member of a community may lead to the instability many feared during the seventeenth and eighteenth centuries, but to hinder the access to knowledge will bring nothing but stagnation and the weakening of human society. Today we face another problem, as Norman Levitt has pointed out: even if the means to education are open to every social *stratum*, we can easily verify that not each and every citizen is interested or able to devote himself to a life of study and investigation. In *Prometheus Bedeviled* (1999) the author harbours no doubts about the harmonious relationship between the advancement of science and democracy, as the model of state in which citizens can think and express themselves freely, thus giving vent to their creativity. However, the requirements of scientific knowledge and research demand years of contradicting the democratic ideal of an equal participation in the public sphere by all the citizens:

> No society, however egalitarian, has ever eliminated the sense that science is an elitist calling, that it demands raw intelligence and special skills that far exceed what is to be expected of the average person. Although improvements in the effectiveness and comprehensiveness of science education may ultimately succeed in developing scientific talent in more people, drawn from a wider range of social and economic backgrounds, it seems doubtful that scientific competence will ever become widespread, let alone universal. (Levitt 3)

From the Enlightenment onwards, science stands out as a determining factor in the shaping of our ways of living and our view of the world. Some may think that the advance in social values and epistemological methods did not actually bring out a better and happier life, or that some people's happier lives imply the sacrifice of other groups. The difficult relation between science and society is deeply etched by the past, by prejudice and superstition, a difficulty that remains unresolved. However, if our culture has nurtured science to its present powerful position, envisaging it as the fruit of knowledge of our tree of life, we may wish the day will come when we will grasp the wisdom to use it in a generous and *bienfaisant* way. Dare to know how!

WORKS CITED

Bacon, Francis. "Novum Organum." *The Works of Francis Bacon*. Volume IV. *Translations of the Philosophical Works*. Elibron Classics Series. Boston, U.S.A.: Adamant Media Corporation, 2005. 39-248.

---. "New Atlantis". *The Advancement of Learning and New Atlantis*. Ed. Arthur Johnston. Oxford: Clarendon Press, 1980. 213-247.

Berlin, Isaiah. *The Age of Enlightenment*. Oxford & New York: Oxford University Press, 1978.

Cavendish, Margaret. "The Description of a new Wold, called The Blazing World". *Margaret Cavendish Duchess of Newcastle. The Blazing World and Other Writings*. Edited by Kate Lilley. London: Penguin Books, 2004. 119-230.

Davies, Herbert, ed. *Pope: Poetical Works.* With an Introduction by Pat Rogers. Oxford: Oxford University Press, 1978. 651.

Gay, Peter. *The Enlightenment: An Interpretation. The Science of Freedom*. New York & London: W.W. Norton & Company, 1977.

Hyland, Paul, Olga Gomez & Francesca Greensides. "Invention". *The Enlightenment. A Sourcebook and Reader*. London: Routledge, 2003. 135-138.

Kant, Emmanuel. "What is Enlightenment?" [1784]. *Practical Philosophy*. Ed. Mary J. Gregor. Introduction by Allen W. Wood. *The Cambridge Edition of the Works of Immanuel Kant*. Cambridge: Cambridge University Press, 1999. 11-22.

Levitt, Norman. *Prometheus Bedeviled: Science and the Contradictions in Contemporary Culture*. New Jersey: Rutgers University Press, 1999.

Locke, John. *An Essay Concerning Human Understanding* [1690]. Ed. Roger Bishop Jones. Web. 2-10-2010. <http:// humanum.arts.cuhk.edu.hk/Philosophy/Locke/echu/>

Porter, Roy. *The Creation of the Modern World. The Untold Story of the British Enlightenment.* New York & London: W.W. Norton & Company, 2000.

Russell, Bertrand. *The Impact of Science on Society*. London & New York: Routledge, 1998.

Swift, Jonathan. "Gulliver's Travels". *The Portable Swift*. Edited, and with an Introduction by Carl Van Doren. London: Penguin Books, 1977. 201-529.

Voltaire. *Letters concerning the English Nation*. Edited with an Introduction and Notes by Nicholas Cronk. Oxford World's Classics. Oxford: Oxford University Press, 1999.